



Working Capital Management and Firm Performance: Lessons Learnt during and after the Financial Crisis of 2007-2008 in Nigeria

Sunday Simon^{*1}, Norfaiezah Sawandi¹, and Mohamad Ali Abdul-Hamid²

¹ *Tunku Puteri Intan Safinaz School of Accountancy, Universiti Utara Malaysia*

² *Department of Accounting, College of Business Administration, University of Sharjah, U.A.E*

Abstract: This study examines the relationship between working capital management (WCM) and firm performance during and after the financial crisis of 2007-2008 in Nigeria. During the crisis, lending conditions were deeply affected, and financing operations became challenging for firms. Although research findings on the causes and effects of the crisis on the economy are known, what remains unknown is whether the financial crisis had a significant impact on WCM performance. This knowledge is essential for developing resilience to withstand a possible crisis in the future because vulnerability remains high as a result of the deepened integration of many economies. Thus, this study addresses this issue using a sample of 675 firm-year observations from listed firms on the Nigerian stock exchange for the period from 2007 to 2015. The differences between the two periods, the crisis period and then after the crisis period, is operationalised through two analyses. First, OLS regression analysis was conducted to determine the explanatory powers of WCM for the two periods via their R^2 s. Second, a test of difference using the Cramer Z-statistic for the two periods was conducted. The findings indicate that WCM variables have more explanatory power (R^2) in the period after the crisis than during the crisis. Also, the results revealed that the Z-scores are significant, implying that a significant difference existed between the two periods. This means that WCM was affected during the financial crisis and led to low profitability, whereas, during the after-crisis period, WCM was associated with higher profitability.

Keywords: Working Capital Management, Financial Crisis, Firm Performance, Nigeria

JEL Classification: D25, G01, M41

Paper Type: Research

* Corresponding author: E-mail: simonsunday016@gmail.com

1. INTRODUCTION

While generalisations regarding the effect of the 2007/2008 financial crisis across countries and businesses are difficult to make, undoubtedly the financial crisis caused a volatile economic cycle. This is evident in the financial market crash, tight lending conditions, and the associated liquidity squeeze that had a significant impact on financial institutions in many countries across the globe (Khor, 2017; Simon, Sawandi & Abdul-Hamid, 2017). The main issue is that businesses find access to finance a major challenge during crisis periods. However, in an environment in which businesses are heavily dependent on bank loans, limited lending options and high-interest rates, weak capital market and a lack of government support make the challenges even greater. These challenges have major impacts on the operational activities of businesses and their performance, especially when banks become risk-averse and lose confidence in lending to businesses. This is especially true for Nigeria and many other African countries. However, a substantial easing of the financing conditions of firms is possible with proper working capital management (WCM). The importance of WCM continues to gain recognition during such periods. Indeed, firms that embrace the practice of WCM can enhance their liquidity position by providing short-term financial sustainability and profitability (Deloof, 2003; Eljelly, 2004; Simon et al., 2017).

As emphasised in the literature, WCM mitigates financing challenges by providing liquidity on a continuous basis for firms to finance their operational activities (Deloof, 2003; Eljelly, 2004, Mathuva, 2014; Afrifa & Padachi, 2016). This measure has been argued to be suitable only for firms that are financially constrained and is seen as unsuitable for unconstrained firms (Murthy 2015; Wasiuzzaman, 2015). The argument about WCM being significant for constrained firms is in line with the studies of Sen and Oruc (2009), Charitou, Elfani, and Lois (2010), Goel and Sharma (2015) and Nobanee and Ellili (2015), in which they revealed that access to finance remains problematic during such periods. They further assert that attention began to focus on WCM as a source of funding after the financial crisis of 2007/2008. This has led to a debate that the fundamental reason for the increased attention that WCM has received was the change in financial and banking sector lending conditions following the financial crisis of 2007/2008, which had a notable adverse effect on the ability and willingness of banks to lend to firms.

Much WCM literature has examined the relationship between WCM and firm performance and how WCM variables should be managed (e.g., Deloof, 2003; Lazaridis & Tryfonidis, 2006; Baños-Caballero, García-Teruel, & Martínez-Solano, 2012; Afrifa & Padachi, 2016). Such measures are designed to only address the liquidity needs of firms during post-crisis periods or during periods when normalcy has returned to the economic system. Most previous studies have often failed to recognise that, while their results might have been effective in providing liquidity and enhancing the profitability of firms in regular periods, they may be inadequate or counterproductive in drawing lessons for future financial crisis or in adopting measures to prevent the adverse effects of that crisis. Therefore, this study aims to understand how WCM is impacted by the financial crisis and the changes in the lending environment as a result of a financial crisis and to discuss lessons upon which firms can draw. In other words, the question that this study address is: how can firms cope and improve operational efficiency, competitiveness and profitability during increased volatile economic cycles?

Addressing rough business financing conditions that have a fundamentally negative impact on the day-to-day operational activities of business is imperative in building

financial resilience in the event of another crisis. This is because many developing and underdeveloped countries have deepened their integration into the international financial system, which can result in new vulnerability and high exposure to external shocks. In light of this, the data for this study were obtained from Nigeria where the 2007/2008 financial crisis had severe effects on her economy due to market integration. The sample comprises 75 non-financial firms. The data obtained were divided into the crisis period and the period after the crisis to understand the impact of the event.

The paper is divided into five sections. Section two contains the literature review and hypotheses development. Section three describes the research method adopted while the analysis and results are presented in section four. The discussion of the results and conclusions and the implications of the study are presented in section five.

2. LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

2.1 Literature Review

Working capital management has become an essential mechanism for generating free cash flow that can fund operational activities and improve the performance of firms. WCM decisions are a top priority for many firms because they serve as an index of a sound liquidity position for a firm, and, thus, WCM has continued to gain more attention from researchers. According to Eljelly (2014), efficient liquidity management depends on the way in which working capital is managed. Although the definitions of WCM vary across different studies, for this current research, WCM is defined in line with Guthman and Dougall (1984), Pandey (2013) and Simon et al. (2017) as the difference between current assets and current liabilities. Current assets refer to assets that can be converted into cash within an accounting year while current liabilities are the claims of outsiders that are expected to mature for payment within one year. However, most WCM studies have adopted measures such as accounts receivable, accounts payable, inventory, the cash conversion cycle and cash conversion efficiency to determine their impacts on firm performance.

The relationship between WCM and firm performance has been studied in different contexts by previous researchers. For instance, Deloof (2003), Lazaridis and Tryfonidis (2006), Tauringana and Afrifa (2013), Almazari (2013), Arshad and Gondal (2013), Tufail, Bilal and Khan (2013), and Korankye and Adarquah (2013) found a significant and negative relationship between WCM variables and profitability. Deloof (2003) used 1,009 Belgian non-financial firms between 1992 and 1996 to determine the relationship between WCM and corporate profitability. Deloof found a negative and significant relationship between gross operating income of Belgian firms and working capital measures. The results also indicated that the manner in which working capital is managed would determine its impacts on firm profitability. Lazaridis and Tryfonidis (2006) examined the relationship between WCM and the profitability of 131 firms listed on the Athens Stock Exchange between 2001 and 2004.

Lazaridis and Tryfonidis (2006) established that a significant relationship exists between the cash conversion cycle and profitability measured by gross operating profit. In line with Deloof (2003), Lazaridis and Tryfonidis (2006) concluded that managers could generate more profit and value for their firms and shareholders by managing the working capital components. Similarly, Tauringana and Afrifa (2013), Almazari (2013), Arshad and Gondal (2013), and Korankye and Adarquah (2013) confirmed the negative relationships between

WCM and firm profitability from different contexts. Tauringana and Afrifa (2013) determined the importance of WCM using 133 SMEs from the Alternative Investment Market (AIM) in the United Kingdom for the period from 2005 to 2009. They found an inverse relationship between the measures of working capital and return on assets. Almazari (2013) evaluated the influence of WCM on the profitability of 8 Saudi cement companies for the period from 2008 to 2012.

Almazari (2013) found a significant inverse relationship between gross operating profits while sales were positively correlated with profitability. Arshad and Gondal (2013) established their results using 21 cement firms listed on the Karachi Stock Exchange during the period from 2004 to 2014 while Korankye and Adarquah (2013) investigated 6 manufacturing firms in Ghana for the period from 2004 to 2011. There is a clear consensus among these authors that reducing the level of WCM produced the negative results, suggesting that WCM is of crucial importance in enhancing firm profitability.

However, Osundina and Osundina's (2014) study found a positive and significant relationship between all the measures of WCM and market value measured by Tobin's Q. This result was ascertained when they determined the effect of WCM on the market value of 12 manufacturing firms. El-Mande and Shuaibu (2016) examined WCM with respect to profitability for food and beverages listed firms in Nigeria. Using a sample of 10 firms examined from 2004 to 2014, they found a significant and positive association between inventory and accounts receivable with profitability while the cash conversion cycle and accounts payables showed a significant and negative association with profitability.

Knauer and Wohrmann's (2013) state-of-the-art analysis provides a more convincing conclusion when they found a positive relationship between accounts payable, accounts receivable, inventory and profitability. They noted that analysing the individual effects of these variables is important. Abuzayed (2012) examined 52 non-financial listed firms in Jordan and found a significant and positive association between the cash conversion cycle, accounts receivable, inventory and gross operating income of firms, while accounts payable was significant and negatively related to gross operating income.

The level of inconsistency in the relationship between WCM variables and profitability requires delving deeper into the study and justifies why financing decisions remain under pressure for many firms. In recent times, debates on WCM tends to concentrate on the increased volatility of the economic cycles caused by the financial crisis, though with a primary focus still on the liquidity and financing challenges. Few studies have recognised that WCM has a vital role to play by providing financial sustainability for firms during a crisis. This requires far greater attention, which this study examines in detail. This is fundamentally important to enhance productivity and the performance of firms.

2.2. Hypotheses Development

Despite the attention given to WCM by managers and researchers, the financial crisis of 2007/2008 revealed severe shortcoming in practices. During the financial crisis, access to finance became very difficult, and, due to the associated risks, banks tightened their credit standards and requirements and became unwilling to lend. Some studies that examined WCM during the financial crisis found that liquidity for both financial and non-financial firms was significantly affected (Haron & Nomran, 2015; Kesimli & Guney, 2011; Ramiah, Zhao, & Moosa, 2014). These studies attributed the failure of firms to a high degree of liquidity shortages, which is crucial for enhancing the productivity and performance of firms. In

addition, firms also faced substantial adverse effects on their operations due to variable exchange and interest rates and high costs of raw materials. This situation altered the amount needed to fund WCM and led to gaps in financing and the liquidity needs of firms.

Theoretically, WCM is operationalised as a multi-dimensional construct that is measured with numerous dimensions that reflect a firm's liquidity position. The most widely adopted measures of WCM are accounts receivables management, accounts payable management, inventory management, the cash conversion cycle and cash conversion efficiency (Deloof, 2003; Filbeck & Krueger, 2005). However, most researchers who examined WCM during a crisis focused on other measures of WCM (e.g., debt, free cash flow, firm size, current assets, liquidity ratio, cash ratio, short-term receivables to the current assets ratio and the current assets to total asset ratio). Only a few researchers have used the traditional WCM variables that reflect firm operations as measures in determining WCM practices during the financial crisis to address financing challenges and generate cash flow that can fuel growth.

Based on this discussion, the following hypotheses are formulated:

- H₁ There is a significant difference in the relationship between WCM and ROA during and after the financial crisis of 2007-2008.
- H₂ There is a significant difference in the relationship between WCM and TQ during and after the financial crisis of 2007-2008.

3. DATA AND RESEARCH METHODOLOGY

The data for this study were drawn from a population of 124 non-financial firms listed on the Nigerian Stock Exchange. The sample period spanned from 2007 to 2015. In line with Ramiah et al. (2014) and Njiforti (2015), this study defines the years from 2007 to 2009 as the crisis period and the years from 2013 to 2015 as the post-crisis period, leading to equal three-year periods, one during the crisis and one during the three years after the crisis. Following previous studies on WCM (Deloof, 2003; Simon et al. 2017), this study excludes all financial firms from the sample, therefore, ensuring greater homogeneity of firms included in the sample.

Also, companies for which the data required to calculate specific variables were unavailable were also excluded. For these reasons, the sample of this study comprised a dataset of 75 non-financial firms. Furthermore, the data generated were winsorized at 3% (Dehnel, 2014). This was done to mitigate the effect of outliers. Consequently, OLS regression analysis was conducted to determine the difference between the two periods with reference to their R²s. The OLS regression assumptions were not violated. Because of the need to meet the various assumptions of the statistical analysis, normality, multicollinearity, homoscedasticity and model specification were evaluated. Violations were corrected using the appropriate techniques and transformation. The differences between the two periods were later confirmed by comparing their R²s using Cramer's Z statistic (Cramer, 1987).

3.1 Variables Measurement and Models

This study adopts both Return on Assets (ROA) and Tobin's Q (TQ) as measures of firm performance. ROA represents the accounting measures while TQ represents the market measures. Also, the independent variable is WCM, and it is comprehensively measured

using accounts receivable management, accounts payable management, inventory management, the cash conversion cycle and cash conversion efficiency. Based on prior literature, firm size, sales growth and financial debt ratio are included as control variables. (See Table 1 for variable definitions and calculation).

Table 1. Definitions of the Variables

Variable	Definition	Calculation
Return on Assets (ROA)	ROA is an indicator of profits as a proportion of a firm's total asset.	Profit After Tax / Total Assets.
Tobin's Q (TQ)	TQ is an indicator of a firm's profitability level as a proportion of its market value.	Equity Market Value + Liability Book Value / Equity Book Value + Liability book value
Accounts Receivable Management (ARM)	ARM measures the average number of days it takes a firm to collect cash from customers after the sale of goods or services have been delivered.	(Accounts Receivable x 365) / Sales
Accounts Payable Management (APM)	APM is an indicator of the period a firm takes to pay its trade creditors.	(Accounts Payable x 365) / Purchases
Inventory Management (INVM)	INVM measures the average number of days it takes a firm to convert its inventory (raw materials) into sales.	(Inventories x 365) / Cost of Sales
Cash Conversion Cycle (CCC)	CCC measures the length of time cash is committed from purchases of raw materials through work in progress to finished goods and until when cash is realised from sales of finished goods.	Accounts Receivable Management + Inventories Management – Accounts Payable Management
Cash Conversion Efficiency (CCE)	CCE measures the ability of a firm to convert profit into cash efficiently.	Cash Flow from Operations / Sales
Firm Size (FS)	FS refers to the rate of growth that a firm is capable of yielding, which is related to the functional expertise, processes and systems for the better management of their activities (e.g. WCM).	Natural Logarithm of Sales
Sales Growth (SG)	SG measures the amount at which the average sales volume of a firm's goods or services has grown, typically, from one year to another.	(This Year's Sales – Previous Year's Sales / Previous Year's Sales.
Financial Debt Ratio (FDR)	FDR measures the percentage of a firm's assets that are financed by debt.	Financial Debt / Total Assets

To analyse the relationship between WCM and firm performance, the following equations are estimated:

$$ROA_{it} = \beta_0 + \beta_1 ARM_{it} + \beta_2 APM_{it} + \beta_3 INVM_{it} + \beta_4 CCC_{it} + \beta_5 CCE_{it} + \beta_6 FS_{it} + \beta_7 SG_{it} + \beta_8 FDR_{it} + \beta_9 D1_{it} + e_{it} \quad (1)$$

$$TQ_{it} = \beta_0 + \beta_1 ARM_{it} + \beta_2 APM_{it} + \beta_3 INVM_{it} + \beta_4 CCC_{it} + \beta_5 CCE_{it} + \beta_6 FS_{it} + \beta_7 SG_{it} + \beta_8 FDR_{it} + \beta_9 D1_{it} + e_{it} \quad (2)$$

Here, subscript $_{it}$ represents the panel data notation; $_i$ = cross-sectional units, $_t$ = periods (i.e., from 2007-2009 and 2013-2015). β is the intercept, $\beta_1 - \beta_5$ are coefficients of the independent variables while $\beta_6 - \beta_8$ are coefficients of the control variables. ROA is return on assets, TQ is Tobin's Q. ARM is accounts receivable management, APM is accounts payable management, INVM is inventory management, CCC is the cash conversion cycle while CCE is cash conversion efficiency. D1 is a dummy variable that takes the value of one (1) for the periods before crisis and zero (0) if otherwise. e is the error term.

To examine whether WCM was affected during the crisis period and fared better after the crisis (the difference between the periods), this study employs the Cramer Z statistic. Thus, each regression (i.e., model 1 and 2 above) is run separately for each period, and the Cramer's (1987) Z statistic was used to compare the R^2 s in the during and after crisis periods for models 1 and 2. The estimation of the standard deviation of the models R^2 's, which adopts the Cramer Z-statistic, is a function of components such as sample size, the number of variables and the true value of the R^2 's. This method is particularly helpful in making comparisons of models without the same dependent variables (Kothari, 2001) and across countries and industries and periods. It has been adopted in this study to determine WCM lessons from the financial crisis. Therefore, this study computes the Cramer Z statistic (see equation 3) to test the hypotheses of whether the relationship between WCM and firm performance was more affected during the financial crisis period than during the period after the crisis.

$$Z = \frac{\hat{R}^2_1 - \hat{R}^2_2}{\sqrt{\text{Var}(\hat{R}^2)_1 - \text{Var}(\hat{R}^2)_2}} \quad (3)$$

$$\text{Where, } \text{Var}(\hat{R}^2) \sim \frac{4}{N} \hat{R}^2(1 - \hat{R}^2)^2 \left[1 - \frac{2(q+1)+3}{N}\right]$$

Here, N is the total sample size, and q is the number of predictors. \hat{R}^2_1 is the adjusted R-squared for regression one and \hat{R}^2_2 is the adjusted R-squared for regression two. $\text{Var}(\hat{R}^2)_1$ and $\text{Var}(\hat{R}^2)_2$ are the variances of first and second regressions respectively.

4. EMPIRICAL FINDINGS

4.1 Descriptive and Correlation

Table 2 presents the descriptive statistics and univariate tests for WCM variables during and after the financial crisis. The descriptive statistics are presented in three sections. First, the full sample is presented in panel A with 675 observations; second, the period of financial crisis is presented in panel B with 225 observations; and third, the period after the financial crisis is also presented in panel B with 225 observations. In this stage, insight is also gained into the significant statistical differences between the crisis period and the after crisis period using the value of the t-statistics for the mean and the Wilcoxon-Mann-Whitney statistics for the median.

Table 2 panel A presents the descriptive statistics for the full sample test variables while panel B shows the univariate comparison results between the crisis period and after crisis samples. The mean (median) value of ROA for the full sample is 0.054 (0.051). The mean (median) value of ROA is significantly different (p-values < 0.10) between the crisis period 0.067(0.058) and the period after crisis 0.036(0.043). TQ has a mean (median) value of 1.936 (1.344) for the full sample and has statistically different values (p-values < 0.10) between the crisis period 2.276 (1.730) and the period after the crisis 1.787 (1.169).

These results indicate that firms in Nigeria made profits in the form of ROA and TQ, thus making their inclusion in this study worthwhile. However, further analysis (panel B) revealed a significant difference between the profits (ROA and TQ) reported during and after the financial crisis. For ARM, the mean (median) value of the full sample is 65.813 (33.986) and indicates that firms take approximately 66 days to collect payments from their

customers for goods sold but there is no statistical difference (p -values > 0.10) between the crisis period 69.338 (34.699) and the after-crisis period 67.881(39.813).

However, the mean (median) value of APM for the full sample is 71.407(42.266) and reveals that it takes an average of 71 days for firms to pay their suppliers. Importantly, the results are significantly different (p -values < 0.10) between the crisis period 63.742 (37.233) and the period after the crisis 78.629 (46.903). Inventory of the firms as shown for the full sample take approximately 100 days to be sold with a median of 82.880 days. The mean (median) of inventory holding is higher during the financial crisis 102.154 (83.464) than the period after the crisis 96.644 (74.414). This is evident because during the financial crisis many firms were slow to respond to declining sales, resulting in excess inventory as depicted. Despite this, the result revealed that the difference between the periods is not statistically significant (p -values > 0.10).

Furthermore, the average mean of CCC was approximately 98 days with a median of 69.811 days. This mean is higher during the financial crisis (108.619) than after the crisis (89.433), but the difference is not statistically significant (p -values > 0.10). The median, on the other hand, is higher during the financial crisis (82.737) than after the crisis (60.144) and is statistically significant (p -values < 0.10). Regarding CCE, the mean (median) value of the full sample is 0.106 (0.102). Meanwhile, the mean (median) value is lower during the crisis period 0.0953 (0.0975) and higher during the period after the crisis 0.113 (0.108). This reveals that the ability of firms to generate cash was lower during the crisis and higher after the crisis. However, the difference is not statistically significant (p -values > 0.10).

The descriptive statistics for the control variables are also examined as Table 2 shows. The mean (median) value of FS for the full sample is 9.879 (9.860). The mean (median) value of FS is significantly different (p -values < 0.10) between the crisis period 9.775 (9.687) and after the crisis period 9.957 (9.949). Similarly, SG has a mean (median) value of 0.133(0.086) and the differences are statistically significant (p -values < 0.10) between the crisis period 0.211(0.178) and the period after crisis 0.036(0.031). Lastly, the FDR has a mean (median) value of 0.573(0.561) that is not significantly different between the crisis period 0.589 (0.574) and the after-crisis period 0.588 (0.582). Table 2 also shows that the skewness and kurtosis are within the range of normal data.

Table 2: Descriptive statistics and univariate comparison for test variables
Panel A: Descriptive statistics for test variables

Variable	Mean	Median	Std. Dev.	Min.	Max.	Skewness	Kurtosis
ROA	0.05392	0.05113	0.09744	-0.2003	0.28572	-0.2055	4.09724
TQ	1.93587	1.34382	1.51153	0.52618	6.85269	1.72763	5.36635
ARM	65.8128	33.9855	85.9142	1.61476	404.844	2.51199	9.40838
APM	71.4069	42.2658	79.6638	1.69197	335.38	1.84605	5.92321
INVM	100.084	82.8802	83.4625	1.989	358.203	1.33995	4.69907
CCC	98.0385	69.8113	120.954	-121.17	469.857	1.21795	4.88086
CCE	0.10642	0.10237	0.24423	-0.6259	0.74165	-0.3136	5.37792
FS	9.87868	9.86017	0.80143	8.26919	11.2692	-0.0638	2.30882
SG	0.13259	0.08566	0.34037	-0.541	1.26439	1.19217	5.80924
FDR	0.57314	0.56139	0.27241	0.07676	1.39987	0.77529	4.23238

Panel B: Univariate comparison between crisis period and after the crisis for the variables

Variable	During crisis (observations = 225)			After crisis (observations = 225)			t-test P-value	Wilcoxon Mann-Whitney test p-value
	Mean	Median	Std. Dev.	Mean	Median	Std. Dev.		
ROA	0.06711	0.05814	0.09398	0.03632	0.04285	0.09532	0.0006	0.0019
TQ	2.27567	1.73002	1.58288	1.78705	1.16917	1.49098	0.0008	0.0000
ARM	69.3384	34.699	93.0576	67.881	39.8133	86.1026	0.8632	0.9468
APM	63.7422	37.2326	74.0545	78.629	46.9031	83.3108	0.0457	0.0700
INVM	102.154	83.4636	85.0241	96.644	74.4145	83.4372	0.4882	0.4172
CCC	108.619	82.7368	124.198	89.4327	60.1444	128.274	0.1077	0.0342
CCE	0.09526	0.09753	0.26727	0.11339	0.10844	0.25134	0.459	0.2990
FS	9.77519	9.68747	0.78645	9.95725	9.94947	0.82101	0.0167	0.0085
SG	0.21061	0.1775	0.36106	0.03586	0.03119	0.29300	0.0000	0.0000
FDR	0.58906	0.57368	0.30635	0.58822	0.58216	0.26227	0.9752	0.9971

Note: All the variables are winsorized at the 3% level. The t-test p-values show the significance of any differences in means reported while the Wilcoxon rank-sum (Mann-Whitney) test p-values show the significance of any differences in the median values.

Table 3 presents the Pearson correlation matrix, and a careful examination of the correlation coefficients for all the variables considered shows that the highest coefficient was 0.6465, which is between CCC and INVM. Such a moderately low correlation suggests that multicollinearity was not an issue in this study. This is because no correlation among a pair of variable exceeds a threshold value of 0.80 to indicate a problem of multicollinearity according to Field (2009). The study also examined the variance inflation factor (VIF) and found a value of less than 2 (though not tabulated). This value was below the threshold value of 10 suggested by Field (2009), hence indicating no severe problem of multicollinearity in this study.

Table 3. Correlations between Variables

Variable	ROA	TQ	ARM	APM	INVM	CCC	CCE	FS	SG	FDR
ROA	1.0000									
TQ	0.2514***	1.0000								
ARM	-0.2401***	-0.1169***	1.0000							
APM	-0.1630***	0.0731*	0.4038***	1.0000						
INVM	-0.1442***	0.0321	0.1932***	0.3215***	1.0000					
CCC	-0.1643***	-0.1009***	0.5748***	-0.0958**	0.6465***	1.0000				
CCE	0.1739***	-0.0154	-0.1464***	-0.0270	-0.0624	-0.1222***	1.0000			
FS	0.3264***	0.0624	-0.3244***	-0.2848***	-0.3743***	-0.3418***	0.0189	1.0000		
SG	0.2276***	0.1040***	-0.0680*	-0.0835**	-0.1058***	-0.0960**	-0.037	0.0647*	1.0000	
FDR	-0.2183***	0.1458***	0.0731*	0.0869**	-0.0302	-0.0290	-0.0754*	0.0751*	-0.0259	1.0000

Note: Significance levels are labelled at ***, **, and * for 1%, 5% and 10% respectively.

4.2. The Relationship between WCM and ROA during and after the Financial Crisis

Table 4 shows the results of the OLS regression of the relationship between WCM variables and ROA, measuring how this relationship differs between the crisis period and the after-crisis period. The results are disaggregated across three categories: first, the pooled data showing the full sample (2007 to 2015), second, the crisis period section utilising 225 observations (2007 to 2009); and third, the period after the crisis employing 225 observations (2013 to 2015). The Table also includes coefficients of all the variables as well as their p-values. With regards to the full sample, the results refer to 675 observations and show that all the coefficients of the variables used in this model, except for CCE, FS, SG and FDR, were not statistically significant. The adjusted R^2 , which illustrates the explanatory power of the model is 0.2404, suggests that the WCM model explained a significant portion (24%) of the variation in ROA. The explanatory power of the full sample's model is comparable to those reported by Sharma and Kumar (2011) and Tauringana and Afrifa (2013).

Similar to the regression results of the full sample, the results regarding the coefficients of the partitioned sample shows that the coefficients of all the variables for the period during the crisis are not statistically significant except for CCE, FS and SG. Concerning the period after the crisis, the coefficients of all the variables employed for the model, except for CCE, FS, SG and FDR, are statistically not significant. Meanwhile, the coefficients of regression results for the period after-crisis are similar to the one obtained from the full sample. Furthermore, the results presented in Table 4 show that during the financial crisis, the R² of the model illustrating the explanatory power is about 0.2071 (20.7%) and is lower than the R² of the period after the crisis of 0.3191 (31.9%). This is interpreted to mean that the explanatory power of WCM after the financial crisis is higher than during the financial crisis. Additionally, the difference in the relationship between WCM and ROA during and after the financial crisis is confirmed using the Cramer's Z- statistic. The results of the Cramer's Z-statistic revealed a Z-score of 2.23, which is statistically significant at the 5% level.

The Z-score result suggests that a significant difference existed in the relationship between WCM and ROA during and after the financial crisis. Meaning that WCM, like many other sources of finance, is affected during a financial crisis. As a result, WCM became not only practically challenging to manage but significantly deteriorated. This effect accounts for the renewed interest or the reason for the increased attention that WCM received following the financial crisis of 2007 to 2008. Insights from this analysis are consistent with the aims of this study and support hypothesis one (H₁), which posits that *there is a significant difference in the relationship between WCM and ROA during and after the financial crisis of 2007-2008*. The results are consistent with Ramiah et al. (2014) who found that the financial crisis altered the WCM practices of firms.

Table 4. Model 1 (Tests for differences in the relationship between WCM and ROA during and after the financial crisis of 2007-2008)

Periods	ARM	APM	INVM	CCC	CCE	FS	SG	FDR	R ²
Pooled 2007-2015	-0.000224 (-1.62)	0.000110 (0.80)	-0.000114 (-0.86)	0.000126 (0.96)	0.0582955 (3.70)***	0.0371096 (7.73)***	0.059115 (4.98)**	-0.077506 (-4.81)***	0.2404
During Crisis 2007-2009	0.0001044 (0.42)	-0.000018 (-0.07)	0.0001805 (0.76)	-0.00014 (0.60)	0.076687 (3.64)***	0.041510 (4.63)***	0.056187 (3.29)***	-0.025401 (-1.13)	0.2071
Post Crisis 2013-2015	-0.000192 (-1.14)	0.000010 (0.05)	-0.000160 (-0.77)	0.000078 (0.47)	0.047975 (1.70)*	0.029858 (4.03)***	0.048102 (1.86)**	-0.097152 (-3.37)***	0.3191
Z -statistic									- 2.23**

Note: Significance levels are labelled at ***, **, and * for 1%, 5% and 10% respectively.

4.3. The Relationship between WCM and TQ during and after the Financial Crisis

Table 5 provides the results of the relationship between WCM and TQ during and after the financial crisis. The result of the relationship between WCM and TQ during and after the financial crisis of 2007-2008 is similar to the results of ROA as reported in Table 4. Table 5 shows that the coefficients of all the variables employed for the full sample, except INVM, CCC, CCE and FS, significantly explain variations in TQ. Dividing the study's sample into subsamples of the financial crisis period versus the period after the financial crisis reveals more insights that firm performance is significantly predicted by WCM variables more in the period after the crisis. During the crisis, only INVM and FDR significantly explain the variation in TQ, whereas, after the crisis, all the variables, except INVM, CCC and CCE, significantly explain the variations in TQ.

Similar results are obtained when the study estimated for the two periods, in which Cramer's Z-statistic was employed to determine the difference in the relationship between WCM and firm performance during and after the crisis. According to the results, the R² of the crisis period is 0.0741 while after the crisis it is 0.133. This means that WCM variables

jointly accounted for 7.41% and 13.3% of the changes in firm performance measured by TQ during and after the financial crisis respectively. This suggests that WCM variables explain the changes in firm performance after the crisis period better than during the crisis period. More specifically, Cramer's Z-statistic indicates that the difference in the relationship between WCM and TQ during and after the financial crisis is statistically significant, suggesting that WCM leads to better performance after a crisis when normalcy has returned to economic activities. This is evident in the Z score of -1.46, which is statistically significant at the 10% level. This result supports hypothesis two (H_2) and leads to the conclusion that *there is a significant difference in the relationship between WCM and TQ during and after the financial crisis of 2007-2008*. This finding also supports the study conducted by Ramiah et al. (2014), and the results of hypothesis one (1).

Table 5. Model 2 (Tests for differences in the relationship between WCM and TQ during and after the financial crisis of 2007-2008)

Periods	ARM	APM	INVM	CCC	CCE	FS	SG	FDR	R ²
Pooled	-0.003597	0.003097	0.000391	0.000595	-0.121182	0.092652	0.490391	0.811919	0.0679
2007-2015	(-2.56)**	(2.12)**	(0.22)	(0.41)	(-0.47)	(0.97)	(2.75)***	(3.62)***	
During Crisis	0.004391	-0.004699	0.008224	-0.005208	-0.061807	-0.010674	0.474576	0.803186	0.0741
2007-2009	(1.10)	(-0.99)	1.93*	(-1.26)	(-0.13)	(-0.06)	(1.55)	(2.05)**	
Post Crisis	-0.004428	0.005509	-0.001926	0.000688	-0.198801	0.286222	0.479333	0.970664	0.1330
2013-2015	(-2.73)***	(2.64)***	(-1.09)	(0.50)	(-0.50)	(1.99)**	(1.90)*	(2.86)***	
Z-statistic									-1.46*

Note: Significance levels are labelled at ***, **, and * for 1%, 5% and 10% respectively.

Thus, the findings of this study are consistent across the two measures of firm performance and established that the relationship between WCM and firm performance differed between the crisis period and the after-crisis period. Specifically, the results suggest that during the crisis, WCM is affected more than the period after crisis. This explains why firms faced liquidity challenges which affected their overall performance. Importantly, many studies and business firms were overly focused on internal factors affecting WCM and how its variables should be managed, but this study highlights that the most impactful factors affecting WCM stem from external forces, such as the financial crisis. According to PwC (2015) during the financial crisis, firms were slow to respond to declining sales, which resulted in excess inventory. Moreover, combined with the reduced payments morale, this led to a steady increase in WCM ratios. These issues require focused efforts by researchers and policymakers because the underlying effect is known to affect WCM and liquidity by extension. In the present instance, what is not known is, therefore, what will trigger the next crisis and when it will happen. Hence, firms must evaluate their vulnerabilities and strengths and prepare now rather than later so that the effects of future financial crisis do not overwhelm them.

5. CONCLUSION

This study examines the relationship between WCM and firm performance during and after the financial crisis of 2007 to 2008 in Nigeria. The study addresses the issue of business financing, which has been one of the most significant challenges for the performance and growth of firms. The results confirm that WCM optimisation is crucial, meaning that the failure to manage it correctly may have a negative impact on a firm's ability to generate cash flow and fund their day-to-day operational activities. Specifically, the study found that a significant difference exists in the relationship between WCM and firm performance during and after the financial crisis as shown by the t-test, Wilcoxon-Mann-Whitney statistics, and the Cramer Z-statistic. The results are consistent with the stated hypotheses. This means that external forces are significant drivers of WCM performance. Hence, the results suggest that a firm's low profitability during a financial crisis is

associated with WCM deterioration while the higher profits reported during the period after a financial crisis are associated with an improvement in WCM.

The results of this study make a direct connection of WCM performance with a financial crisis and illustrate the fact that, business firms need to understand better how global financial crisis (or global economic conditions) can affect WCM and lending conditions, to prepare against being overwhelmed in the wake of a future crisis. Hence, managers and policymakers should be aware of the implications of the volatility of the external environment on the short, medium and long-term performance of firms. They should be aware that as a crisis period stimulates liquidity problems, so too should they draw the appropriate conclusion that WCM needs are negatively affected during such periods, especially regarding a liquidity squeeze. Therefore, to foster higher performance, managers and policymakers need to develop a framework that guarantees adequate liquidity at low costs to boost productivity on a sustainable basis.

Finally, these results are based on Nigerian data, in which the financial crisis of 2007-2008 delivered negative consequences to her economy due to market integration. However, these results are of significant benefit for many developing and underdeveloped countries because of the deepened integration of the majority of these economies into the worldwide financial system. This market integration has resulted in new vulnerabilities. Therefore, more research should be conducted in developing and underdeveloped countries to reveal the underlying effects and increase their resilience to a financial crisis or any other external shock in the future, mainly by comparing WCM practices during and after the financial crisis. Furthermore, future research might consider studying the variables that drive WCM during a financial crisis since all the variables in this study yielded mixed findings.

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